

CLAIMS

1. An Ni-based single crystal super alloy having a composition comprising 5.0-7.0 wt% of Al, 4.0-10.0 wt% of Ta, 1.1-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.0-5.0 wt% of Cr, 0-9.9 wt% of Co and 4.1-14.0 wt% of Ru in terms of its weight ratio, with the remainder consisting of Ni and unavoidable impurities.
2. An Ni-based single crystal super alloy having a composition comprising 5.0-7.0 wt% of Al, 4.0-6.0 wt% of Ta, 1.1-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.0-5.0 wt% of Cr, 0-9.9 wt% of Co, and 4.1-14.0 wt% of Ru in terms of weight ratio, with the remainder consisting of Ni and unavoidable impurities.
3. An Ni-based single crystal super alloy having a composition comprising 5.0-7.0 wt% of Al, 4.0-6.0 wt% of Ta, 2.9-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.0-5.0 wt% of Cr, 0-9.9 wt% of Co and 4.1-14.0 wt% of Ru in terms of weight ratio, with the remainder consisting of Ni and unavoidable impurities.
4. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.9 wt% of Al, 5.9 wt% of Ta, 3.9 wt% of Mo, 5.9 wt% of W, 4.9 wt% of Re, 0.10 wt% of Hf, 2.9 wt% of Cr, 5.9 wt% of Co and 5.0 wt% of Ru in terms of weight ratio, with the remainder consisting of Ni and unavoidable impurities.
5. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.8 wt% of Al, 5.6 wt% of Ta, 3.1 wt% of Mo, 5.8 wt% of W, 4.9 wt% of Re, 0.10 wt% of Hf, 2.9 wt% of Cr, 5.8 wt% of Co and 5.0 wt% of Ru in terms of weight ratio, with the remainder consisting of Ni and unavoidable impurities.
6. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.8 wt% of Al, 5.8 wt% of Ta, 3.9 wt% of Mo, 5.8 wt% of W, 4.9 wt% of

Re, 0.10 wt% of Hf, 2.9 wt% of Cr, 5.8 wt% of Co and 6.0 wt% of Ru in terms of weight ratio, with the remainder consisting of Ni and unavoidable impurities.

7. An Ni-based single crystal super alloy according to anyone of claims 1 to 6 further comprising 0-2.0 wt% of Ti in terms of weight ratio.

8. An Ni-based single crystal super alloy according to anyone of claims 1 to 7 further comprising 0-4.0 wt% of Nb in terms of weight ratio.

9. An Ni-based single crystal super alloy according to anyone of claims 1 to 8 further comprising at least one of elements selected from B, C, Si, Y, La, Ce, V and Zr.

10. An Ni-based single crystal super alloy according to claim 9 having a composition comprising 0.05 wt% or less of B, 0.15 wt% or less of C, 0.1 wt% or less of Si, 0.1 wt% or less of Y, 0.1 wt% or less of La, 0.1 wt% or less of Ce, 1 wt% or less of V and 0.1 wt% or less of Zr in terms of weight ratio.

11. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.0-7.0 wt% of Al, 4.0-10.0 wt% of Ta, 1.1-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.0-5.0 wt% of Cr, 0-9.9 wt% of Co, 10.0-14.0 wt% of Ru, 4.0 wt% or less of Nb, 2.0 wt% or less of Ti, 0.05 wt% or less of B, 0.15 wt% or less of C, 0.1 wt% or less of Si, 0.1 wt% or less of Y, 0.1 wt% or less of La, 0.1 wt% or less of Ce, 1 wt% or less of V and 0.1 wt% or less of Zr.

12. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.8-7.0 wt% of Al, 4.0-5.6 wt% of Ta, 3.3-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.9-4.3 wt% of Cr, 0-9.9 wt% of Co, 4.1-14.0 wt% of Ru, 4.0 wt% or less of Nb, 2.0 wt% or less of Ti, 0.05 wt% or less of B, 0.15 wt% or less of C, 0.1 wt% or less of Si, 0.1 wt% or less of Y, 0.1 wt% or less of La, 0.1 wt% or less of Ce, 1 wt% or less

of V and 0.1 wt% or less of Zr.

13. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.0-7.0 wt% of Al, 4.0-10.0 wt% of Ta, 1.1-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.9-5.0 wt% of Cr, 0-9.9 wt% of Co, 6.5-14.0 wt% of Ru, 4.0 wt% or less of Nb, 2.0 wt% or less of Ti, 0.05 wt% or less of B, 0.15 wt% or less of C, 0.1 wt% or less of Si, 0.1 wt% or less of Y, 0.1 wt% or less of La, 0.1 wt% or less of Ce, 1 wt% or less of V and 0.1 wt% or less of Zr.

14. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.0-7.0 wt% of Al, 4.0-6.0 wt% of Ta, 3.3-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.0-5.0 wt% of Cr, 0-9.9 wt% of Co, 4.1-14.0 wt% of Ru, 4.0 wt% or less of Nb, 2.0 wt% or less of Ti, 0.05 wt% or less of B, 0.15 wt% or less of C, 0.1 wt% or less of Si, 0.1 wt% or less of Y, 0.1 wt% or less of La, 0.1 wt% or less of Ce, 1 wt% or less of V and 0.1 wt% or less of Zr.

15. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.0-7.0 wt% of Al, 4.0-5.6 wt% of Ta, 3.3-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.0-5.0 wt% of Cr, 0-9.9 wt% of Co, 4.1-14.0 wt% of Ru, 4.0 wt% or less of Nb, 2.0 wt% or less of Ti, 0.05 wt% or less of B, 0.15 wt% or less of C, 0.1 wt% or less of Si, 0.1 wt% or less of Y, 0.1 wt% or less of La, 0.1 wt% or less of Ce, 1 wt% or less of V and 0.1 wt% or less of Zr.

16. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.0-7.0 wt% of Al, 4.0-10.0 wt% of Ta, 3.1-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.0-5.0 wt% of Cr, 0-9.9 wt% of Co, 4.1-14.0 wt% of Ru, 4.0 wt% or less of Nb, 2.0 wt% or less of Ti, 0.05 wt% or less of B, 0.15 wt% or less of C, 0.1 wt% or less of Si, 0.1 wt% or less of Y, 0.1 wt% or less of La, 0.1 wt% or less of Ce, 1 wt% or less of V and 0.1 wt% or less of Zr.

17. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.8-7.0 wt% of Al, 4.0-10.0 wt% of Ta, 3.1-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.0-5.0 wt% of Cr, 0-9.9 wt% of Co, 4.1-14.0 wt% of Ru, 4.0 wt% or less of Nb, 2.0 wt% or less of Ti, 0.05 wt% or less of B, 0.15 wt% or less of C, 0.1 wt% or less of Si, 0.1 wt% or less of Y, 0.1 wt% or less of La, 0.1 wt% or less of Ce, 1 wt% or less of V and 0.1 wt% or less of Zr.
18. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.0-7.0 wt% of Al, 4.0-10.0 wt% of Ta, 3.1-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.9-4.3 wt% of Cr, 0-9.9 wt% of Co, 4.1-14.0 wt% of Ru, 4.0 wt% or less of Nb, 2.0 wt% or less of Ti, 0.05 wt% or less of B, 0.15 wt% or less of C, 0.1 wt% or less of Si, 0.1 wt% or less of Y, 0.1 wt% or less of La, 0.1 wt% or less of Ce, 1 wt% or less of V and 0.1 wt% or less of Zr.
19. An Ni-based single crystal super alloy according to anyone of claims 1 to 3 having a composition comprising 5.0-7.0 wt% of Al, 4.0-10.0 wt% of Ta+Nb+Ti, 3.3-4.5 wt% of Mo, 4.0-10.0 wt% of W, 3.1-8.0 wt% of Re, 0-0.50 wt% of Hf, 2.0-5.0 wt% of Cr, 0-9.9 wt% of Co, 4.1-14.0 wt% of Ru, 0.05 wt% or less of B, 0.15 wt% or less of C, 0.1 wt% or less of Si, 0.1 wt% or less of Y, 0.1 wt% or less of La, 0.1 wt% or less of Ce, 1 wt% or less of V and 0.1 wt% or less of Zr.
20. An Ni-based single crystal super alloy according to anyone of claims 1 to 19 wherein, when lattice constant of matrix is taken to be a_1 and lattice constant of precipitation phase is taken to be a_2 , $a_2 \leq 0.999a_1$.
21. An Ni-based single crystal super alloy according to claim 20 wherein the lattice constant of the precipitation phase a_2 is 0.9965 or less of the lattice constant of the matrix a_1 .

22. An Ni-based single crystal super alloy, wherein lattice constant of its precipitation phase α_2 is 0.9965 or less of lattice constant of its matrix α_1 , and having a composition including Re and Ru, and 2.9-4.5 wt% of Mo.

23. An Ni-based single crystal super alloy, wherein lattice constant of its precipitation phase α_2 is 0.9965 or less of lattice constant of its matrix α_1 , and having a composition including 2.9-4.5 wt% of Mo, 3.1-8.0 wt% of Re and 4.1-14.0 wt% of Ru.

24. An Ni-based single crystal super alloy according to anyone of claims 1 to 23 wherein a dislocation space of the alloy is 40 nm or less.